

CLAIMS

That which is claimed is:

- 5 1. A method for optical excitation of a sample comprising: a) exciting the sample with two wavelengths of light, causing the sample to emit light of distinctive emission characteristics or to change other optical properties, b) generating the two excitation wavelengths from a single light source, c) detecting the emitted light or the optical property change from the sample, (d) moving the sample a
10 pre-determined distance, e) repeating steps (a) to (d) a predetermined number of times thereby creating a multitude of representations of the excitation light spots.
2. The method as in claim 1, wherein the excitation of sample is accomplished with a Raman shifter as excitation light source.
- 15 3. The method as in claim 2, wherein the excitation of the sample is a two-photon process.
4. The method as in claim 2, wherein the excitation of the sample is a two-color
20 (two-photon) process.
5. The method as in claim 1, wherein the two wavelengths of light are obtained from one Raman shifter.

6. The method as in claim 1, wherein the single light source is a Raman shifter.
7. The method as in claim 1, wherein the distinctive emission characteristic is
5 fluorescence.
8. The method as in claim 1, wherein the distinctive emission characteristic is Raman.
- 10 9. The method as in claim 1, wherein the change in other optical properties is a refractive index change.
10. The method as in claim 1, wherein the excitation wavelengths are generated by optically pumping a Raman cell.
- 15 11. The method as in claim 10, wherein a Raman cell is optically pumped by another laser.
12. The method as in claim 11, where the laser is a high-peak power pulsed
20 laser.
13. The method as in claim 11, wherein the Raman cell is filled with a Raman medium.

14. The method as in claim 12, wherein the Raman medium is gas.
15. The method as in claim 13, wherein the gas is hydrogen.
- 5 16. The method as in claim 13, wherein the gas is methane.
17. The method as in claim 13, wherein the gas is deuterium.
- 10 18. The method as in claim 1, wherein the emitted light is detected using a photomultiplier tube or photodiode.
19. The method as in claim 1, wherein the emitted light is detected via optical fiber bundle.
- 15 20. The method as in claim 1, wherein the sample is moved at a pre-determined distance of 5 microns or less.
21. The method as in claim 20, wherein moving the sample at three possible
- 20 orthogonal directions forms the image.
22. An apparatus for the optical excitation of a sample comprising of a light source, an excitable sample, two confocal excitation beams of two different

wavelengths, a photodetector to detect the signal, a sample holder, and a mechanism to move the holder in three possible orthogonal directions.

23. The apparatus as in claim 22, wherein the light source is a Raman shifter.

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24. The apparatus as claim 22, wherein the mechanism to move the holder is a three-axis translation stage.